

Claims

What is claimed is:

1. A wavelength converting laser device, comprising:

a laser diode including an optical resonator having a pair of facing reflectors including a reflecting surface having a shape reducing loss in optical resonator with regard to a specific horizontal transverse mode of a laser as compared to the loss in optical resonator for other horizontal transverse modes; and

a wavelength converter for converting the laser into a harmonic.

2. The wavelength converting laser device of Claim 1, wherein the shape of the reflecting surface of the pair of the facing reflectors is substantially parallel to a wavefront of the laser.

3. The wavelength converting laser device of Claim 1, wherein one of the pair of the facing reflectors includes a distributed reflectance-Bragg-grating-reflector integrally formed with the laser diode.

4. The wavelength converting laser device of Claim 1, wherein one of the pair of the facing reflectors includes a coating integrally formed on one facet of the wavelength converter having a curved surface shape convex toward a direction of outside of the optical resonator.

5. The wavelength converting laser device of Claim 1, wherein one of the pair of the facing reflectors includes a distributed-reflectance-Bragg-grating-reflector integrally formed with the wavelength converter.

6. The wavelength converting laser device of Claim 1, wherein the laser diode is a broad-area laser diode including an optical waveguide structure for controlling a vertical transverse mode of the laser.

7. The wavelength converting laser device of Claim 1, wherein the wavelength converter includes an optical waveguide structure for controlling a vertical transverse mode of the laser and for controlling a vertical transverse mode of the

harmonic.

8. The wavelength converting laser device of Claim 1, wherein the wavelength converter is a quasi-phase matching-wavelength converter having a periodically domain-inversed structure.

9. The wavelength converting laser device of Claim 8, wherein the shape of the periodically domain-inversed structure is almost parallel to a wavefront of the laser.

10. The wavelength converting laser device of Claim 1, wherein the wavelength converter includes a $\text{MgO} : \text{LiNbO}_3$ crystal having a z-axis of crystal axis almost aligned with a polarization direction of the laser.

11. The wavelength converting laser device of Claim 1, wherein the wavelength converter is disposed within the optical resonator.

12. The wavelength converting laser device of Claim 1, wherein the

optical resonator, the laser diode, and the wavelength converter are integrated.

13. The wavelength converting laser device of Claim 1, further comprising a reflector, for reflecting the harmonic, disposed between the laser diode and the wavelength converter.

14. The wavelength converting laser device of Claim 1, further comprising transverse mode converting means for reducing mode mismatching between a vertical transverse mode of the laser in the laser diode and a vertical transverse mode of the laser in the wavelength converter.

15. The wavelength converting laser device of Claim 1, further comprising a temperature control means for controlling temperature of the laser diode and temperature of the wavelength converter.

16. The wavelength converting laser device of Claim 1, wherein a ratio of a wavelength-shift to temperature change at a lasing wavelength of the

laser of the laser diode is almost the same as a ratio of a wavelength-shift to temperature change at a phase matching wavelength of the laser of the wavelength converter.

17. A display device, comprising:

a laser diode including an optical resonator having a pair of facing reflectors with a reflecting surface whose shape reduces loss in optical resonator with regard to a specific horizontal transverse mode of a laser as compared to loss in optical resonator for other horizontal transverse modes; and

a wavelength converter configured to convert the laser into a harmonic; wherein the laser diode and the wavelength converting laser device are a light source for generating an image.

18. The display device of Claim 17, wherein the light source for generating an image is a light source for green light among three elementary colors

19. The display device of Claim 17, wherein the light source for generating an image is a light source for blue light among three elementary colors.

20. The display device of Claim 17, further comprising:
a liquid crystal as optical modulating means for generating an image.

21. The display device of Claim 17, further comprising:
digital reflecting means as optical modulating means for generating an image.